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APRIL 22, 1991

CHEMICAL & ENGINEERING

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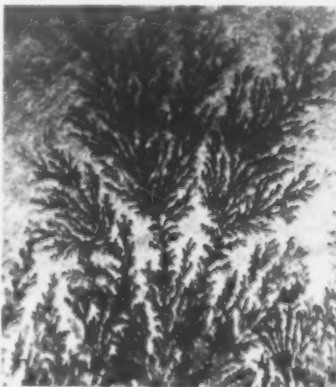
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LETTERS

Hiring older chemists

The ACS Comment by John S. Connolly, "Economic Status of Chemical Professionals" (C&EN, Feb. 18, page 37) is a breath of fresh realism compared with recent handwringing over the demographics of chemical employment typified by your article on the "Campaign for Chemistry" (C&EN, Dec. 17, 1990, page 37), which sets "critical needs" for use of solicited funds to include "the need to maintain an adequate supply of scientists and engineers."

Connolly accurately points to the older unemployed as a source of scientists and engineers, and notes that they actually are available in excess of the 1% statistic since some who are laid off near retirement age do not seek employment. And even 1% averages to five months' unemployment over a lifetime career.

As an older, multidegreed unemployed engineer, I can report from the field that Connolly only understates. There are so many experienced chemical professionals chasing so few jobs that personnel departments have found it convenient to adopt de facto rules of thumb that may keep some of us from ever regaining meaningful employment. Engineers and scientists in charge should become aware of, and try to reduce, these roadblocks.

One troublesome rule of thumb is that anybody unemployed is obviously no good. I overheard this directly from a company recruiter. These days, activity in many product divisions and much academic R&D—as well as industrial—is being reduced (C&EN, Jan. 14, page 20). Even those forewarned can end up unemployed, for once rehired, seniority disappears, and that engineer or scientist can well be the first to go if the new employer cuts back.

A second rule of thumb says, "Only those with current experience doing exactly what we want done will be considered." This probably cuts a pile of résumés by 75%, mostly at the expense of more experienced people whose last employment category is by definition not in current demand. Rapid screening using this rule can be done by clerical help, who cannot appreciate that an older candidate can be more adaptable, by virtue of his or her disparate experience, than one with the "two to five years of experience" so popular in the ads. Incidentally, how can one have five years of experience without having two? C&EN should not accept such ads except for

positions in which age discrimination is defensible.

The continuing presence of early retirement programs is prima facie evidence that there is no shortage of scientific or engineering personnel. A third rule of thumb also refuses to consider those early retired for further employment. While not suffering the full financial burden of unemployment, the early retired are a vast labor source, often anxious to continue their work. They also suffer from rule two.

A fourth rule of thumb dictates consideration of only those candidates who will not be moving. The chronically under- or unemployed scientist or engineer may be trapped in his or her geographical area because prospective employers wish to avoid paying moving (or interviewing) expenses, and the candidate cannot logically move without a new job to go to.

A fifth rule of thumb from recruiters says, "We won't hire a candidate into a lesser position than he last had." This is what is meant by being overqualified. Evidently most organizations dislike unused competence! It is surprisingly difficult to get an entry-level position at entry-level salary when overqualified. Often the only alternative is to leave the profession.

Curiously, I know of one clever company that hires only older scientists and

Correction

• March 25, page 26: Citations were inadvertently omitted from several of the figures in the Special Report on Ion Trap Mass Spectroscopy. They should have been cited as follows: The figure on page 27 is from Wuerker, R. F., Shelton, H., Langmuir, R. V., *J. Appl. Phys.*, **30**, 342 (1959) (figures 5 and 11). The upper figures on page 33 are from Hayward, M. J., Riederer, D. E., Kotiaho, T., Cooks, R. G., Austin, G. D., Syu, M.-J., Tsao, G. T., *Process Control Qual.*, **1**, 105 (1991) (figures 5a and 5c). The lower figure on page 33 (top half) is from Kaiser, R. E. Jr., Cooks, R. G., Syka, J. E. P., Stafford, G. C. Jr., *Rapid Commun. Mass Spectrom.*, **4**, 31 (1990) (figure 3a). The bottom figure in the box on resonant ejection on page 35 is from Kaiser, R. E. Jr., Louri, J. N., Amy, J. W., Cooks, R. G., *Rapid Commun. Mass Spectrom.*, **3**, 226 (1989).

U.K. chemical capital spending takes dip

Capital spending by the U.K. chemical industry fell 8% in real terms in 1990 from 1989, and the predictions are that it will fall another 4% in 1991. That was the main message from the annual investment intentions survey of the U.K. Chemical Industries Association (CIA) in London earlier this month, a survey that accounts for roughly 80% of total U.K. chemical spending.

Moreover, the downward trend is predicted to continue into 1992 and 1993. A longer and deeper recession, with delays in further interest-rate reductions, would result in even greater cutbacks to the industry's spending program, the association's economists added.

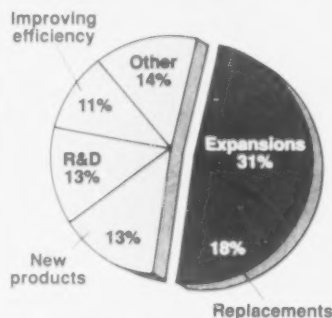
That the U.K. is in a recession, and has been since the latter half of 1990, is no surprise. However, said Keith Wey, CIA's senior economist, "the

speed and severity of the recession was greater than had been expected, and had forced many companies to reappraise their spending. In fact, the level of spending now expected for 1991 and 1992 combined is almost a third lower in real terms than forecast in last year's survey."

Total fixed capital spending for 1991-93 is estimated at about \$10.5 billion in current prices—roughly \$3.25 billion less than predicted last year. And 1991 figures probably will be overly optimistic, the association conceded somewhat gloomily.

In analyzing 1990 actual performance from that which had been forecast a year ago, CIA said that of the companies responding to its detailed questionnaire, 27 spent less than forecast, five spent more than intended, and one was right on target. Deepening pessimism and uncertainty brought more decisive action than in previous years. In 1989, some 74% of the underspending was attributed to postponements and

Expansions, replacements lead investment plans



1991-93 chemical industry investment = \$10.5 billion^a

^a \$1.00 = £0.53 on Dec. 31, 1990.
Source: U.K. Chemical Industries Association

rephasing; in 1990, only 54% was. However, whereas in 1989 only 13% related to cancellations, last year cancellations accounted for 38% of the underspending, according to CIA.

Spending plans for petrochemicals and plastics have many execu-

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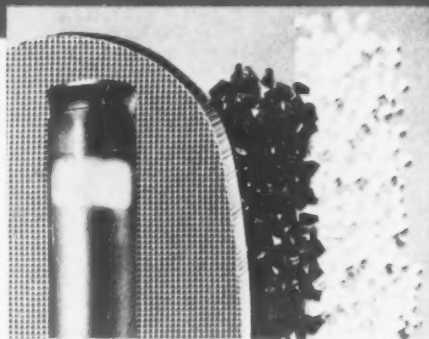
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tives in the industry concerned about possible overcapacity. "In our recent history, the U.K. chemical industry has had a patch with excellent profitability, good margins, high plant utilization, and outstanding return on capital," points out Bryan Sanderson, chief executive officer of BP Chemicals.

The good times have led to a spate of new project announcements, he says. Some of these may never come to pass, but others certainly will. "Even with an optimistic view, an expansion program of ethylene means that utilization will fall to about 90%. With a no-growth scenario, utilization will fall to the mid-70s. Our forecast is somewhat pessimistic; we think it will be closer to no growth—which leaves room for concern."

According to Sanderson, "One would hope that investment intentions would be reducing, particularly in respect of capacity expansions, leaving only those projects based on genuine competitive advantage."

The only areas showing probability of consistent spending growth are environment, health and safety, and energy savings. These areas accounted for 11% of the industry's capital expenditures in 1989, but this is expected to more than double to an average of 28% of all capital spending from 1991 to 1993. Of that, 11% will be for energy saving, another 9% for environmental protection, and 8% for health and safety measures.

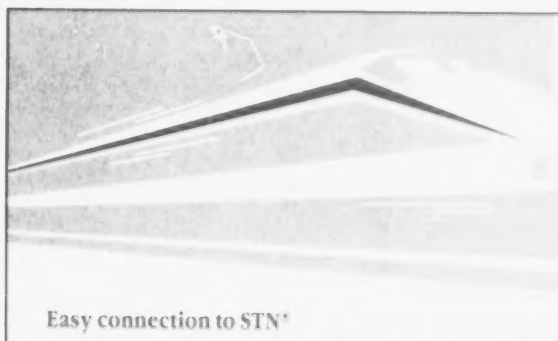
According to Clive Thompson, vice president, Arco Chemical Europe, answers to the specific environmental questions in the spending-intentions survey showed that two thirds of the companies said they are increasing expenditures as a result of internal decisions, in contrast to 33% who are doing so as a result of regulatory pressures.

Most of the expenditures—47% in the years 1990-92—would be going to water protection, Thompson says, with an increase in spending of 127% from 1989. Waste cleanup and dis-

posal will take another 29%, representing an increase in spending of 146% from 1989. The total chemical industry waste disposal cost of nearly \$400 million in 1990 represented an increase of 33% over 1989, and similar increases are seen for coming years.

All told, it was a gloomy outlook for the next three years. However, CIA economists point out that in the last recession, the drop in U.K. chemical spending from its peak in 1978-80 to 1981-83 was 36%. By that measure, the fall of 14% in real terms from 1988-90 to 1991-93 is somewhat less painful. According to CIA, although competitiveness has deteriorated over the past year, the U.K. is in a better position than at the start of the 1980s, and levels of surplus capacity throughout Europe are not so high as in 1980. Moreover, environmental spending now regarded as essential is much higher than 10 years ago.

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Walter Massey Takes Over Helm of National Science Foundation

New director brings a softer approach and a clear idea of changes necessary to guide the nation's preeminent science agency into the 1990s

Will Lepkowski, C&EN Washington

When physicist Walter E. Massey was picked last fall to succeed Erich Bloch as director of the National Science Foundation, science watchers in Washington had one big question on their minds. Would Massey—or wouldn't he—follow in the footsteps of his predecessor, Erich Bloch?

Most hoped he wouldn't. The voltaic Bloch, they felt, tramped with hobnailed boots through the manicured gardens of academic science. His aim was to shift the culture of basic science in the U.S. by tying NSF-supported research more closely to industrial, engineering, and economic themes. In form at least, Bloch fulfilled his agenda. He transformed the image of NSF as an agency insulated from the U.S.'s economic challenges to one in which most of the major technological research frontiers would be engaged.

Although Bloch did the right thing politically, he succeeded in alienating much of the basic science community. Academics accused him of wrecking the spirit of the basic research enterprise by taking money basic researchers thought they deserved and applying it to expanded engineering and education programs. Bloch told them the country had real problems, that they should be thankful for the substantial sums NSF already was giving them, and that they should stop acting like

spoiled, entitled brats. Academic cheers rose and mugs were lifted when the Bush Administration decided last year not to give Bloch another six years at the NSF helm.

If engineer Bloch stalked the science scene in heavy boots, Massey steps onto the stage in designer shoes, an engaging manner, and a lot of empathy for academic values. Colleagues say no person could be more equipped for the tasks before him—mollifying the basic research establishment while reconciling it further to economic purposes. Bloch was blunt. Massey is tactful and subtle, and that should win him friends in Washington.

Massey is 52 years old and the second black—after his friend John B. Slaughter, now president of Occidental University in Los Angeles—to run NSF. He has traversed many worlds in his time, from physics to music to civil rights marches down South, and has seen success in them all. His origins are in the deep, segregated South of Hattiesburg, Miss., where his promise was spotted so early that by the 11th grade he was sent off to college. The school was Morehouse, a historically black college in Atlanta with its legendary president, Benjamin Mays, who Massey recalls as a "towering figure in black higher education."

Morehouse was a place, Massey recalls, "where one learned discipline, self-motivation, self-responsibility, and postponement of gratification. It was very valuable, especially for many of us who were from small towns. We certainly didn't have any social graces, but we got a healthy knowledge of what would be required to be successful. We also had role models right there who demonstrated that this was not just theoretical material. They showed us that it had worked."



Massey: change only in emphasis

Massey is concerned about the high attrition rate of minority students with technical skills. The thought of dropping out of science never occurred to him, mainly because, as he puts it, "I went to college early." He adds, "It's amazing. I used to read this book about the great migration when blacks left the South. But it's funny, I don't think attrition meant anything in Hattiesburg, Miss. You just went to school, period—unless your parents were dead or you were sent to reform school. There was no question of that."

Massey took his time coming to Washington when his nomination was announced last fall. He was comfortably positioned as vice president for research at the University of Chicago but at the time of selection was preparing to go to Europe under an NSF contract to study European Community science policies. In the meantime, deputy NSF director Frederick M. Bernthal, a chemist

and protege of former Sen. Howard Baker, ran the agency while Massey toured that continent's research centers.

He has plenty of experience in the field of government, education, and competitiveness, beginning with his most recent job at Chicago. There he had responsibilities for the university's research program as well as for the Department of Energy's Argonne National Laboratory, which the university is under contract to manage.

Prior to that, Massey headed Argonne and spread his time around by serving during different periods on the National Science Board and the President's Council of Advisers on Science & Technology. At Argonne he formed a program designed to bring companies together with universities and Argonne in efforts to develop new research-based technologies. Massey established a program of dialogue between scientists and journalists in Chicago to improve understanding between the two different worlds of inquiry. A musician (tuba and saxophone to name two), Massey serves on various arts and cultural committees around Chicago. In addition, he also is a member of several corporate boards.

With a background that spans the kinds of cultures the agency now routinely interacts with, Massey seems ready to shape NSF for the unpredictable 1990s. He's concerned about the U.S.'s domestic and international problems but, along with most observers of science policy, says he isn't much concerned about this nation's losing its international lead in fundamental research. "We still have the world's best system of research and training," he says. "But other countries are investing in basic research at a faster rate than we are. And they will get more competitive in the long run."

Still, Massey believes the pressure put on NSF to connect research more closely with competitiveness will only increase. "The policies grew under Erich Bloch's NSF and I support them," he says. "I don't think we should be decreasing our emphasis on fundamental research, but we're going to need more programs that make that link. I don't

see where emphasizing one deemphasizes the other."

Massey says he has no plans to make any big structural changes at NSF. "It will continue to reflect the nation's needs. I do think there will be some changes in emphasis though. We've put into place a number of programs under Erich and Congress has encouraged us to put a number of others in, like in education. Many of these programs are fundamentally different in character from the traditional base of NSF."

Accordingly, he has set up task forces to reevaluate NSF's international programs, its entire program evaluation, policy evaluation, and data analysis activities, and its role in technological competitiveness. Of some concern are serious delays being encountered in preparing the next Science & Engineering Indicators report, which is also being revamped. Also under study is whether the agency's scattered programs in the environmental, Earth, and geophysical sciences ought to be recombined in ways that better reflect their interconnections. And under review is the popular Presidential Young Investigator awards, which critics say need to reflect peer-based selection rather than well-crafted letters of recommendation from elite mentors.

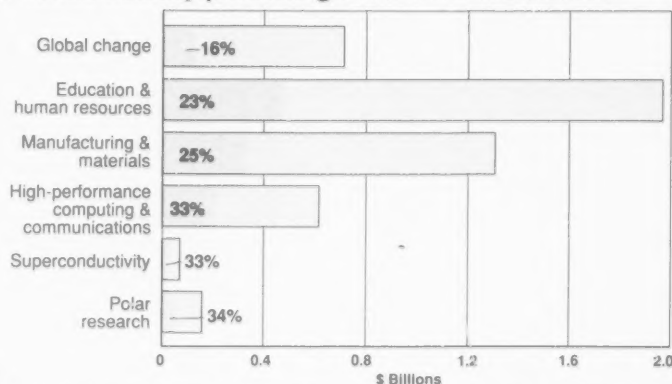
Massey says NSF's role traditionally has been to judge by peer review processes the competency of the individual researcher, the quality of his or her research. "It had not

been our role to follow up and see whether that research had any applications," he says. But he adds that because NSF is now investing hundreds of millions of dollars in education and human resources and big university engineering centers, Congress and the public have a stake in knowing how successful they are. "These are programs that ought to be measured," he points out. "We ought to be able to see that we are making some visible contribution over some agreed upon period."

"So we will be doing more to determine how we measure the return on these investments, whether we can find ways to see if in fact we are accomplishing what these programs are designed to do. So in many of these programs we will be putting in evaluation mechanisms, more than we have in the past; looking into long-term strategies and how they are paying off; and trying to set measurable goals to which we can be held accountable."

One example of needed evaluation Massey points to is in the so-called Statewide Systemic Initiatives program in which NSF funds renewal of whole education programs in entire states. Evaluation mechanisms are part of the grant proposal for this program. Another program Massey is especially high on is Alliance for Minority Participation. One of its goals is to decrease attrition among those who already have shown an interest in science, math,

NSF funds healthy percentage in critical R&D areas



Note: Based on fiscal 1992 budget proposal; NSF's share of \$76 billion federal R&D budget is 3.6% or \$2.7 billion.
Source: National Science Foundation

and engineering. "Attrition of people with natural talent in science is one of our biggest losses," Massey laments. "If we could turn that around it would be the most effective thing we could do. This program won't just consist of giving grants to institutions to do that, but will have milestones to measure how we've done."

Also slated for more attention is NSF's role in bolstering "feeder" colleges—the small liberal arts institutions that supply the bulk of successful Ph.D. students. Massey is one of the stellar examples of one who came out of such a system and went on to a distinguished graduate and research career. "There are still students who for many reasons," he says, "are not accepted at the majority institutions but who are very talented, have a great deal of potential and ability, but need more time and maybe a nurturing environment but one with tough standards. That's what these schools have traditionally done."

Massey says NSF is establishing programs, for example, that make use of mentors in the development of scientific talent in colleges—activities that would "bring undergraduates into the lab to give them a sense of how science is done and establish personal relations between students and faculty members."

Massey acknowledges NSF will be playing a role in President Bush's "new world order," but admits that he doesn't quite yet have a sense of Bush's concept. The agency already has offices in Paris and Japan where research in Europe and the Far East are monitored. Would Eastern Europe be next? Possibly. "It's one of the areas we are looking at internally now. The international area is one that's motivated by lots of things—first by the changes in Europe, new opportunities and challenges everywhere, and by the fact that more and more major projects require more international cooperation. And there's always been the question in my mind of whether we are doing enough to provide opportunity for our scientists and engineers to have international experiences and contacts."

One of the most politically sensitive issues Massey will have to face

on Capitol Hill is the government's role in the funding of new laboratories on campuses. NSF, under a laboratory facilities act Congress forced on it three years ago, has funded in modest ways some facilities in various levels of colleges and universities (\$20 million for fiscal 1991). For fiscal 1992, however, the Office of Management & Budget eliminated the program, which was never very popular at NSF anyway. Although White House science adviser D. Allan Bromley, who had wanted \$200 million in the budget for facilities, opposed the action, NSF had to go along. Massey is concerned, too, but speaks diplomatically about it. What the universities got instead was \$50 million in new instrumentation support.

He admits the facilities problem is serious but believes universities have tended to look too much toward the government to solve it. "Facilities [improvement] is going to require a national approach," he says. "It's too big for NSF alone to do it. But a national approach means that a lot of things have to be looked at in universities."

Massey says facilities are only a small part of the issues that need looking at in universities anyway. "There's not only the sufficiency of direct funding for facilities but also indirect costs, depreciation rates, and ways to encourage that the depreciation portion of indirect costs actually goes into rehabilitation and upkeep of buildings. One problem I am familiar with from my Chicago experience is the impact of the 1986 tax bill, which put a cap on the amount of tax-exempt borrowing the institutions could make. So it's not direct funding but all the things that affect the university's ability to invest in capital facilities. That is being looked at and Bromley's office is trying to organize it in a more comprehensive way."

Massey also has thoughts on the issue of misuse of indirect cost funds that have put universities in a bad light lately. "If one looks at research dollars going into universities, they've obviously gone up. On the other hand, faculty feel that they are under more pressure than they have been. So what's the disconnect? I think we're asking the wrong ques-

tion when you limit yourself to saying how much federal research dollars are going to institutions. One has to ask what is the amount of total federal support—from student loans to facilities—going to these institutions. Looking at the total, I would suspect that the amount is not at all increasing."

"If you look at the whole range of issues I think you're going to find that the ability of universities to support research by themselves has been limited. What the individual faculty member sees is that they no longer can hire technicians because the university can't pay for such costs. Laboratories no longer have a glass-blowing shop, they don't have a machine shop or an electronics shop. All of it has to be charged to their grants now, and what they see as direct discretionary funds for research are being constrained. I can't prove that yet, because I don't have the data. But I think that's what we should be looking at, and we're going to do that here."

So when Massey says he is not planning many changes at NSF, a qualifier should state, "for now." He is concerned that the reputation of science has slipped in the public eye and that the image needs a lot of repair. He is pondering ways of involving scientists more in the political process. He plans a heavy schedule of outside ambassadorial activities on behalf of federal science and NSF. A new directorate on the behavioral sciences probably will be established, opening new vistas for NSF in applying those fields to attacking the country's social problems, largely neglected during the Reagan years.

Thus, Massey's plate seems full for the next six years. But will he stay the full term or will he follow his career pattern of moving on when a better job beckons? "Accepting this job was a major decision," he says. "My wife and I and my family discussed it. I never really thought I'd come to work in the federal government. It's just not something I wanted to do. This came about through a set of circumstances I didn't seek, so I'm just going to see how it goes. I'm assuming that if I do a good job here, the future will take care of itself."